

REMARKS

Claims 1-79, 113-131 and 141-152 are pending in this application. Applicant acknowledges with appreciation the allowance of claims 1-79, 113-123 and 141-150.

Claims 124-131 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kubo et al. (U.S. Patent No. 3,860,956) (“Kubo”) in view of Merrill et al. (U.S. Patent No. 6,150,683) (“Merrill”). This rejection is respectfully traversed.

The present invention relates to an imager having improved color pixel sensor cells. As such, amended independent claim 124 recites a “color imaging sensor” comprising *inter alia* “a substrate having a first defined region for sensing a first color wavelength component,” “a second defined region for sensing a second color wavelength component” and “a third defined region for sensing a third color wavelength component.” Amended independent claim 124 also recites that “the lower boundaries of each of said first, second and third defined regions are located at respective different depths from a surface of said substrate and are displaced laterally such that said defined regions do not overlap, and wherein at least one of said regions is a retrograde well doped to a first conductivity type.” Amended independent claim 124 further recites “a photosensor formed in each one of said first, second and third defined regions.”

Kubo relates to a target for a color image pick-up tube that does not use a color filter. (Col. 1, lines 4-5). For this, Kubo discloses photo-electric conversion elements sensitive to any one of red, green, and blue components of incident light. Kubo teaches three regions in a substrate which are sensitive to red, green, and blue light, respectively, wherein each of the regions has a different depth. (Col. 4, lines 44-46).

Merrill relates to a CMOS-based color pixel with reduced noise in the blue signal. Merrill teaches that “[t]he blue signal of a CMOS-based color pixel is increased with respect to the red and green signals by lowering the doping concentration of the

surface regions of the pn-junction photodiodes that are used in the blue imaging cells with respect to the surface regions of the pn-junction photodiodes that are used in the red and green imaging cells.” (Abstract).

The subject matter of claims 124-131 would not have been obvious over Kubo in view of Merrill. Specifically, the Office Action fails to establish a *prima facie* case of obviousness. Courts have generally recognized that a showing of a prima facie case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355, 47 U.S.P.Q.2d 1453, 1456 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573, 37 U.S.P.Q.2d 1626, 1630 (Fed. Cir. 1996).

Neither Kubo nor Merrill, whether considered alone or in combination, teach or suggest the limitations of claims 124-131. Kubo does not disclose, teach or suggest the limitations of amended independent claim 124. Kubo discloses three separate regions in a substrate for sensing red, green, and blue light, respectively, wherein each of the regions has a different depth. (Col. 4, lines 44-46). Kubo teaches forming the regions of an epitaxial layer which is doped to a p-type or an n-type conductivity. (Col. 4, lines 34-38). However, Kubo is silent about “at least one of said regions” being “a retrograde well doped to a first conductivity type,” as recited by amended independent claim 124.

Likewise, Merrill does not teach or suggest first, second and third defined regions wherein “the lower boundaries of each of said first, second and third defined regions are located at respective different depths from a surface of said substrate and are displaced laterally such that said defined regions do not overlap, and wherein at least one of

said regions is a retrograde well doped to a first conductivity type,” as recited in amended independent claim 124. In Merrill, n-type well 212, which would arguably correspond to the “retrograde well doped to a first conductivity type” of the claimed invention, is not provided with “a photosensor formed in each one of said first, second and third defined regions,” as in the claimed invention; in Merrill, the n-type well 212 is the photosensor itself.

In addition, Applicant notes that a person of ordinary skill in the art would not have been motivated to combine the teachings of Kubo with those of Merrill. As noted above, one requirement for establishing a *prima facie* case of obviousness is that there must be some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine reference teachings. Courts have generally held that “[I]t is insufficient that the prior art disclosed the components of the patented device, either separately or used in other combinations; there must be some teaching, suggestion, or incentive to make the combination made by the inventor.” Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990). This way, “the inquiry is not whether each element existed in the prior art, but whether the prior art made obvious the invention as a whole for which patentability is claimed.” Hartness Int’l, Inc. v. Simplimatic Engineering Co., 819 F.2d 1100, 1108 (Fed. Cir. 1987). Accordingly, a determination of obviousness “must involve more than indiscriminately combining prior art; a motivation or suggestion to combine must exist.” Pro-Mold & Tool Co., 75 F.3d at 1573.

In the present case, a person of ordinary skill in the art would not have been motivated to combine the teachings of Kubo with those of Merrill. The crux of Kubo is a color target for a pick-up tube that has three different grooves corresponding to each conversion depths of green, red and blue, and which does not require three color filters on the surface of the target. Kubo specifically emphasizes that a “single crystal P-type substrate 20 . . . is *engraved* to form different grooves.” (Col. 4, lines 24-28; emphasis

added). In contrast, Merrill teaches the formation of a CMOS color pixel with reduced noise in the blue signal by “lowering the doping concentration at the surface region of the pn-junction photodiode.” (Col. 4, lines 32-37). For this, Merrill teaches providing a “diffused or retrograde well” in a semiconductor substrate. Thus, Merrill teaches the formation of a doped well by doping a semiconductor substrate, and not the formation of grooves in a semiconductor substrate (by etching, for example) which are then filled with semiconductor material, as in Kubo. Accordingly, there is no motivation to combine the doping of Merrill with the grooves of Kubo and, for at least these reasons, the Office Action fails to establish a *prima facie* case of obviousness. Withdrawal of the rejection of claims 124-131 is respectfully requested.

Claims 151 and 152 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kubo in view of Merrill and in further view of Tsuei et al. (U.S. Patent No. 5,945,722) (“Tsuei”). This rejection is respectfully traversed.

Tsuei relates to a color active pixel sensor cell having an oxide filter. (Col. 1, lines 6-8). According to Tsuei, an active pixel sensor cell is formed with a plurality of spaced-apart regions of a second conductivity type formed in a substrate. Tsuei further discloses oxide layers of different thicknesses formed over the regions of a second conductivity type for reducing “the number of to-be-passed photons which are attenuated by conventional dyed resin filters.” (Col. 3, lines 21-25).

The subject matter of claims 151 and 152 would not have been obvious over Kubo in view of Merrill and Tsuei. Again, the Office Action fails to establish a *prima facie* case of obviousness. None of Kubo, Merrill and Tsuei, whether considered alone or in combination, teaches or suggests all limitations of claims 151 and 152. As noted above, neither Kubo nor Merrill, whether considered alone or in combination, teaches or suggests all limitations of amended independent claim 124, from which claims 151 and 152 depend. Similarly, Tsuei does not teach or suggest “a retrograde well doped to a first conductivity

type,” much less that “the lower boundaries of each of said first, second and third defined regions are located at respective different depths from a surface of said substrate and are displaced laterally such that said defined regions do not overlap, and wherein at least one of said regions is a retrograde well doped to a first conductivity type,” as recited in amended independent claim 124. For at least these reasons, withdrawal of the rejection of claims 151 and 152 is also respectfully requested.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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